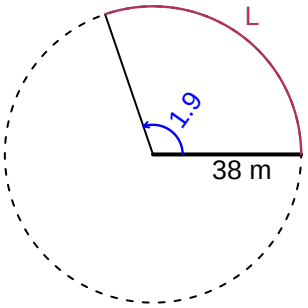
Name: Date:

Trig Final (Solution v13)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.9 radians. The radius is 38 meters. How long is the arc in meters?

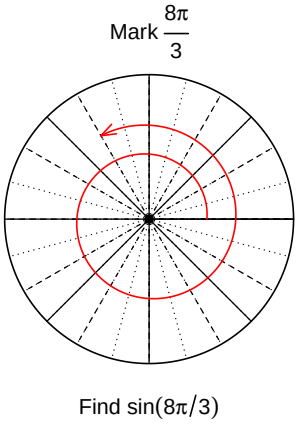


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

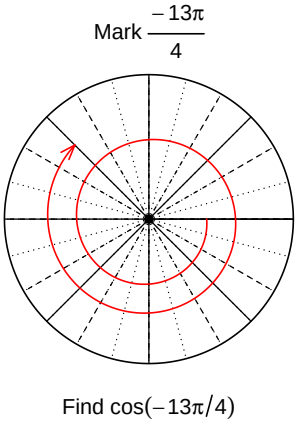
$L = 72.2$ meters.

Question 2

Consider angles $\frac{8\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{8\pi}{3}\right)$ and $\cos\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(8\pi/3)$



Find $\cos(-13\pi/4)$

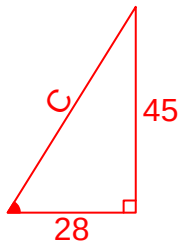
$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-45}{28}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

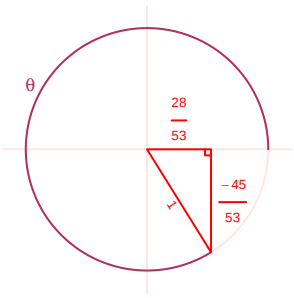
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + 45^2 = C^2$$
$$C = \sqrt{28^2 + 45^2}$$
$$C = 53$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-45}{53}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -6.22$ meters, an amplitude of 7.31 meters, and a frequency of 2.59 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -7.31\cos(2\pi 2.59t) - 6.22$$

or

$$y = -7.31\cos(5.18\pi t) - 6.22$$

or

$$y = -7.31\cos(16.27t) - 6.22$$